



MOON STONES UNDER GLASS get a close scrutiny by Barbara Watson, Billie Berry and Barbara Burdick during a two-day display in the Lunar Receiving Laboratory. The box on the stage of the left microscope contains fine-grained lunar soil in which individual grains and glass fragments are visible. The right microscope is focused on a small chip of igneous rock in which vesicle walls and individual mineral grains can be seen. The display included a selection of igneous rocks, breccias and soils from samples returned by the Apollo 11 and 12 missions, and plans are afoot to set up a permanent display for MSC employees.

## Test Skylab Workshop Sails Today for MSC

A Skylab Workshop "dynamic test article" today left the West Coast aboard the USS Point Barrow with MSC as its ultimate destination. The Workshop is a ground test version of the Skylab to be launched into Earth orbit in 1972 and visited three times by three-man crews in missions lasting up to 56 days.

Scheduled to arrive at the MSC barge dock on Clear Lake January 6, the Workshop will be offloaded and moved to Structures and Mechanics Division's Vibration and Acoustic

Test Facility in Bldg 49, where it will undergo a four-month test program.

The vibro-acoustic test program will subject the Workshop to launch environment noise levels and frequencies and to simulated launch phase vibrations.

After the MSC testing is complete, the Workshop will be moved by barge to Marshall Space Flight Center for static structural testing in simulated launch conditions. The test article Workshop was modified by McDonnell Douglas from an S-IVB stage facility vehicle formerly used at Kennedy Space Center for assembly and ground test checkout.

The Workshop has all crew quarter floors and partitions, and actual or simulated equipment has been installed to provide the same mass and dynamic characteristics as the flight model.

The USS Point Barrow will stop at the Michoud Assembly Facility in New Orleans, where the Workshop will be transferred to a NASA barge December 30 for the trip to MSC.

## Apollo 14 Tests Pick Up After Problem Delays

The Apollo 14 spacecraft integrated systems test this week was resumed after an interruption of several days because of some problems. The command module computer had a command failure during a check of the back-up guidance system during tests on Kennedy Space Center Pad 39A.

The computer was replaced with another unit, but it, too, was removed after subsequent testing showed a problem in computer system cabling. A cabin switch for jettisoning the command module apex cover was also found to be faulty and was changed out.

Project managers at the Cape decided to X-ray welds in tubing connected to the redesigned cryogenic oxygen storage tanks in the service module after a weld cracked when a technician inadvertently grabbed a tubing line. All welds in the plumbing in the oxygen tank area have been verified by pressure tests.

Three phases of Apollo 14 flight simulations were run this week in the Mission Control Center in conjunction with the spacecraft simulators at KSC. Milton Windler's maroon team of flight controllers Wednesday ran lunar ascent simulations, and Jerry Griffin's gold team ran descent simulations Thursday. The flight crews were in the KSC simulators.

Prime Apollo 14 flight director M. P. "Pete" Frank's orange team was scheduled today to run a "math model" EVA 1 simulation in the Control Center.

In Apollo 15 preparations, the launch vehicle this week was demated in the KSC Vehicle Assembly Building to rule out possibility of bonding in the painted surface at the base of the interstage adapter above the S-II stage. A similar precaution was taken with the Apollo 14 launch vehicle before it was moved to the pad.

(Continued on Page 2)

## Meet Reviews Earth Resources Program Results

Government, industry and university scientists reviewed the results of NASA's Earth Resources Aircraft Survey Program during the third program report at MSC this week.

More than 400 scientists attended the sessions which were aimed toward exchange and discussion of Earth resources data gathered during the past year by NASA instrumented aircraft. The sessions covered hydrology, geography, geology, oceanography, agriculture and forestry, and results of spacecraft photography analysis and other projects supported by the NASA Earth Resources Survey Support Research and Technology Program.

Reports presented included preliminary results of the aircraft flights in support of the 1970 census, Oregon State University's albacore tuna fishery study, and many other multi-disciplined studies ranging from East Coast urban development surveys to Mid-West crop condition surveys.

The three-day program was divided into five separate sessions: geological survey, oceanographic and atmospheric, agriculture and forestry, and technology. NASA Earth resources specialists also presented reports on proposed regional Earth resources activities at MSC, Wallops Station, Va., Mississippi Test Facility, Ames Research Center and Lewis Research Center.

# ROUNDUP

NASA MANNED SPACECRAFT CENTER

HOUSTON, TEXAS



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EXTENDS EVA RANGE —

## Cooling Water Buddy System To Be Carried on Apollo 14

Sharing a tank of compressed air on the way back to the surface is a standard emergency procedure among Scuba divers. The

### Gardiner Named IEEE Fellow

Robert A. Gardiner, Assistant Director of Engineering and Development for Electronic Systems, last month was elected a Fellow of the Institute of Electrical and Electronics Engineers.

The IEEE board of directors named Gardiner to the Institute's highest membership grade for his "technical leadership in the development of manned spacecraft guidance, navigation, and control systems." Gardiner's election, along with 122 others picked as 1971 IEEE Fellows around the world, will become effective January 1.

The new Fellows will receive their award certificates from local IEEE sections, and will be recognized at the annual banquet of the IEEE International Convention and Exposition in New York next March.

mouthpiece is passed back and forth between the two divers who share the air remaining in a good air tank—called, logically, the "buddy system."

The buddy system approach has been adapted to moonwalks through the use of connecting lines that feed cooling water from an astronaut's backpack life support system to the space suit worn by his companion. The connections would give the men enough time to return to the lunar module if the water cooling system of one of the backpacks failed.

Called the Buddy Secondary Life Support System (BSLSS), the lifesustaining pair of flexible hoses will be provided for the first time in the Apollo 14 third United States manned lunar landing, now scheduled for launch January 31, 1971. The hose connectors are stored in the modular equipment transporter (MET), where they are readily accessible in an emergency. The BSLSS was developed by Crew Systems Division.

During moon walks or other operations in the hard vacuum of space, the PLSS supplies an

astronaut with about eight hours of breathing and suit-pressurizing oxygen and water flow for the liquid cooling garment—a suit of knitted longhandles with thin tubing woven in the torso and limbs. The tubes carry water from a reservoir in the PLSS, and the circulating water serves

(Continued on Page 2)

## Annual Awards Given Dec. 14

The annual MSC Awards Ceremony will be held December 14 in the Auditorium at 3 pm.

MSC Associate Director Frank Bogart will be master of ceremonies and Deputy Director Christopher C. Kraft, Jr. will make the presentations to MSC employees of 47 Certificates of Commendation, 73 Certificates of Superior Achievement, and 10 Certificates of Appreciation to contractor firms. One group Achievement Award will be made.

Most of the Awards are related to the Apollo 13 inflight emergency last April.



TOP TICKET SALESMAN for the recent MSC annual picnic are shown with their prizes for ticket touting. Left to right are MSC picnic cochairman Susan Cardenas, Carol Robb and Harlan Starnes who tied for third place and received billfolds; Edie Todd with a bun warmer for second place, and Geraldine Taylor with her first-place silver chip-and-dip tray. Picnic chairman Gordon Hughton said that he and all committee members wanted to express "appreciation to the winners and to all the many other ticket sellers for their year's picnic a success."

## Apollo 14 Buddy System *(Continued from Page 1)*

to carry the astronaut's metabolic heat to a heat exchanger in the PLSS.

If the oxygen system in the PLSS fails, emergency oxygen is supplied by a small oxygen tank atop the PLSS. Before the buddy secondary life support system was devised, the emergency tank was required to furnish not only suit pressure and

breathing oxygen, but also cooling through a high flow rate. The buddy secondary life support system, by sharing the water supply between two crewmen, stretches the time the emergency oxygen will last from about 30 minutes to a full hour.

Apollo 14 module pilot Edgar D. Mitchell said, "On the lunar surface, one of the greatest problems of the work is dissipating the metabolic heat that you build up. You don't want to build it up and store it in the body, and the buddy secondary life support system allows us to tie these two cooling systems together and get a greater distance from the lunar module than we could without it. Without the BSLSS, Mitchell continued, "we have to use oxygen for cooling as well as breathing, and that's a rather inefficient way of doing it."

The BSLSS hoses are eight and a half feet long, but are prevented from reaching their full length when connected from one PLSS to the other by a four and a half

foot long tether. The tether snaps to the waist restraint straps of both men's spacesuits, and prevents damage to the water hoses or to the spacesuits during the trek back to the lunar module. Each man assists the other in making the connections.

## Employees Vote 'Yes' to AFGE

American Federation of Government Employees Local 2284 exclusive right to represent units of both professional and nonprofessional MSC general schedule employees working in Houston.

In an election held November 24, the majority of professional employees voted to be represented by the AFGE as a separate bargaining unit from the nonprofessional employees. The vote was 563 for and 472 against AFGE representation.

Of 795 nonprofessional employees voting, 659 voted for and 136 voted against AFGE representation.

About 60 percent of the 3000 eligible MSC employees voted in the election.

As a result of the election, AFGE will act for and negotiate agreements covering employees in the bargaining units, and will be represented at formal discussions between management and employees. Additionally, AFGE will represent employees in grievances and appeals and consult on personnel policies and practices, and in other matters affecting general working conditions.

The five bargaining units representing nonsupervisory MSC employees are: Houston GS nonprofessional employees, Houston GS nonprofessional employees, and Wage Grade employees—all represented by AFGE Local 2284; employees of Technical Services Division Model and Plastics Branch represented by the Pat-

## Apollo 14 Tests—

*(Continued from Page 1)*

The Apollo 15 lunar module ascent and descent stages this week were in systems testing in the KSC Manned Spacecraft Operations Building.

Apollo 15 prime crewmen David Scott, Alfred M. Worden and James B. Irwin spent most of this week in the Apollo simulators at MSC, and in lunar module and lunar roving vehicle reviews, geology briefings and suit fittings. Command module pilot Worden took part in spacecraft hardware tests at North American Rockwell, in Downey, Calif. late in the week.

Apollo 15 prime and backup commanders and lunar module pilots tomorrow will leave for a geology field trip to the main island of Hawaii and will return December 13.

## Suggestors, Inventors Share \$2150 Award

Suggestion and invention award money totaling \$2150 was shared by 22 MSC employees at an award ceremony Tuesday.

Top cash award went to Robert L. Hymer of TCSD, who received a \$300 invention award and a \$25 Tech Brief award for his audio signal processor invention. A \$300 invention award went to Leo G. Monford, also of TCSD for his radiometric temperature reference.

Fred R. Spross of CSD received a \$200 invention award for the Apollo crew biological isolation garment (BIG).

Technical Services Division chief Jack Kinzler and his deputy David L. McCraw each got \$150 invention awards for collaborating on an emergency escape system for closed spaces.

Invention awards of \$100 each went to the following: William E. Zrubek of TCSD for Schmitt trigger multivibrator for use as a tool in digital electronics; Maxwell W. Lippitt of CSD for an improved method for curing single-component silicone rubber and similar materials; and Arthur G. Trader and Harold I. Johnson of FCSD for a pneumatic amplifier for reduced-gravity simulation applications.

Kenneth L. Jones of Engineering Division received a \$75 suggestion award for suggesting locking of mechanical equipment rooms to improve safety and security.

Spacecraft Design Office chief Caldwell C. Johnson got a \$50 invention award for developing a visual target for retrofire attitude control for potential use in "lifeboat" reentry vehicles. Raymond H. Bradley of E&D staff office got a \$50 invention award for an emergency earth orbital escape device.

Henry O. Pohl, Jack E. Capps and Richard B. Ferguson, all of P&PD, each received \$50 invention awards for a two-step rocket engine bipropellant valve. Frank A. Burgett and Jerry C. Poradek of CSD each got \$50 invention awards for developing a process for conditioning tanned sharkskin for potential space garment application.

Harold D. Cubley of TCSD got a \$50 invention award for an antenna array phase quadrature tracking system. Willard S. Hodge of TSD and William N. Lingle of P&PD each got \$50 suggestion awards for developing a method of filling high-pressure nitrogen tanks at a higher rate.

Suggestion awards of \$25 went to Virgie L. Dur of Aircraft Operations for suggesting windows in blind doors opening into warehouse traffic lanes, and to Ben Davis, Jr. of MSD for suggesting method for encouraging greater use of messenger envelopes for intercenter mail.

## Guaymas Station Signs off; Turned Over to Mexico

The Guaymas-Empalme tracking station in Mexico Monday was handed over to the Mexican government for exclusive operations supporting Mexican scientific programs. The station, with the call sign GYM, is no longer needed for Apollo missions.

Apollo mission profile changes have reduced the need for tracking and data gathering and eliminated the need for the Guaymas station. NASA has closed two other ground stations in the network and retired three tracking ships and four aircraft during the past year.

Some of the equipment at Guaymas used for Apollo will be removed for spares at other stations, while other equipment will be left in places for supporting Mexican space activities and for future programs of mutual interest to NASA and Mexico.

In addition to the cooperation that has existed between the Mexican National Commission for Outer Space (CNEE) and NASA in the operation of the Guaymas station, the two agencies are currently cooperating in two projects. One will develop a system approach to the use of weather data acquired from U. S. weather satellites by automatic picture transmission (APT) equipment. The other project will develop capabilities and applications for Earth observations utilizing advanced airborne remote sensing instrumentation. Plans are being completed for a new cooperative project involving synoptic meteorological sounding rocket launchings.

The Guaymas station on the state of Sonora Gulf of California coast, built in 1961, played a key role in tracking American manned flights in the Mercury, Gemini, and Apollo series through Apollo 13 last spring. It has been a major link in the worldwide Manned Space Flight Network managed by NASA's Goddard Space Flight Center, Greenbelt, Md.

Dr. George M. Low, Acting NASA Administrator, stressed that the cooperative establishment and operation of the station over the 18 most exciting years in space exploration stands as a tribute to the friendship and understanding between the two countries.

## FCSD Gridders Win Top Slot

by Dennis Doherty

Flight Crew Support Division captured its first EAA Flag Football championship with a perfect 11-0 record.

Led by quarterback Bill Jackson, and with receivers Bud Henderson, Paul Hendrickson, L. J. Corcoran, Dave Worley, Terry Neal and Nate Leach downfield, and the line blocking of Paul Folwell and Larry McWhorter, the FCSD offensive averaged 36 points per game. The defense was equally tough — allowing only seven points average per game.

Defensive standouts were Corcoran, Jackson, McWhorter, Tim White, Richard Juday, Jon Axford, Rudy Rushing, Alva Hardy, Bert Davila, Jim Axley, Jim Derbonne and Nate Hardee.

Last year's champs, the Roaches, won second place after their 26-16 win in a playoff with the Tigers.

Flag Football Final Standings		
1st half:	won	lost
FCSD	6	0
TANG	4	2
Roaches	4	2
Tigers	3	3
FCD	2	4
EAFB Outlaws	2	4
2103 Comm Sqdn	0	6
2nd half:	won	lost
FCSD	5	0
Tigers	4	1
Roaches	3	2
FCD	2	3
TANG	1	4
EAFB Outlaws	0	5

# Season's Happenings

## LIONS SELL YULE TREES

The Bay Area Lions Club tomorrow and Sunday will hold a non-profit Christmas tree sale at the Nassau Bay Holiday Inn parking lot.

Douglas fir and Scotch pine trees, priced from \$1.69 for five to six footers to \$5.25 for seven and eight footers, will be sold on a first-come first served basis.

Club president Herb Harman said, "Enough commercialism has been injected into Christmas. This is our small way of putting humanity back into the season."

Money taken in over the cost of the trees will be donated to the Lion's Crippled Children's Camp in Kerrville, the Lion's Lighthouse for the Blind and to other club charity projects.

## MSC CHRISTMAS PARTY

"Christmas on This Good Earth" will be the theme of the MSC Christmas Party December 12 at Galveston's Moody Center.

Entertainment will include dance music upstairs by the Frank Incaprera band, and rock music downstairs by the Wheatstone Bridge. The \$5 per person tickets include free setups, beer and a snack table. The party will run from 8 pm to 1 am.

Doorprizes will be dinner for two at the Steak and Ale, Club Seville, Holiday Inn, Sheraton Kings Inn and Captain Hanks, and gift certificates from the House of Mark, Camino Coiffures, Leslie's Fashions and Vicki's Fashions. For those wishing to overnight in Galveston, discounts have been arranged at Jack Tar, Holiday Inn, Galvez Hotel, the Seahorse, the Commodore, Gaido's and the Flagship. Advance reservations can be made with Linda Shirley at 4546 or Joanne Sanchez at 2486.

Party tickets are available from EAA representatives.

## CLEAR LAKE BOAT LANE

The Clear Lake Chamber of Commerce eighth annual Christmas Boat Lane will be held December 12 from 8 to 9:30 pm in the entrance to the Seabrook-Kemah channel. The boat parade features yachts and fishing boats up to 50 feet in length with lights and decorations.

## BAY CHORUS CONCERT

The Bay Area Chorus December 13 will present its fifth annual free Christmas Concert at

8:30 pm in the MSC Auditorium.

The 90-member Chorus will present a program with a "Sound of the Centuries" theme, with selections ranging from the renaissance to the present by composers such as Bach, Handel, Hadyn, Palestrina, Schalk and Fetter.

Soloists will be bass Doug Miller singing "My God is a Rock," soprano Esther Haynes in the spiritual "Mary Wore Three Links of Chain," alto Marcia Mallard in "O Holy Night" (*Cantique de Noel*), and "Gloria in Excelsis Deo" accompanied by the Chorus.

The Chorus has been planning the program since September, and holds rehearsals each Sunday night.

## KIDS' CHRISTMAS PARTY

Tickets are now on sale for the eighth MSC Children's Christmas Party December 19 from 2 to 4 pm in the MSC Auditorium. Children age two through 10 are invited, and tickets at \$1 each are available from EAA representatives.

Channel 13's Cadet Don will present a program aided by Sergeant Garnett of the Houston Police Department. The Texas Hot Shots will provide Christmas music, and the party will close with Santa Claus and Company distributing gifts.



FRIST-PLACE HARDWARE in the form of a trophy was brought home by the LRDS, who won the Deer Park slow-pitch softball tournament in the final game November 9. Team members left to right are Mike Collins, Ivan Johnson, Jim Larey, Nick Lance, Milt Heflin, Ron Epps, Paul Chaput, Keith Kuhlenschmidt, Millard Pettit and Mel Richmond. Not in photo: Dale Moore and Dell Forest

## Theater Tickets Out Next Week

EAA discount passes to Interstate Theaters, ordered earlier this year, will be distributed Monday and Tuesday at lunch time in both cafeterias. Persons failing to pick up their ticket orders should call Geraldine Taylor at 5365.

## Paralyzed Boys Aided by P&PD

Two teenage boys who survived a head on auto collision that killed their parents are having life made somewhat easier through the efforts of employees in Propulsion and Power Division.

Harlton Chaudoin, Jr. 17 and Tommy Chaudoin 13, are the sons of Harlton and Dorothy

Chaudoin and are living with their grandparents in San Antonio. Both boys are paralyzed from the waist down as a result of the crash. Dorothy Chaudoin formerly was an employee in P&PD and her husband worked for Lockheed at MSC before they moved to Huntsville, Ala.

David Bell of P&PD organized a fund drive within the division which raised \$553 toward adding a room for the boys onto the grandparents home. Local businessmen and craftsmen in San Antonio donated additional labor, money and supplies for the project.

# Roundup Swap-Shop

(Deadline for Swap-Shop classified ad is Thursday of the week preceding Roundup publication date. Ads are limited to MSC civil service employees and assigned military personnel. Maximum length is 15 words, including name, office code and home telephone number. Send ads in writing to Roundup Editor, AP3)

### REAL ESTATE

3-bdr 2-bath brick on 1/2-acre, fenced, drapes, near schools and shopping, 6 1/2% loan. Roberts, 485-3862

### RENTALS

Late model 2-bdr mobil home, ground tent, trash pickup incl, \$118/mo. Snyder, 932-5615.

### AUTOS

62 VW, rebuilt engine, 80,000 miles, good condition, orig owner. \$425. Canin, 591-2856.  
67 Riviera, xclnt condition, loaded, stereo FM. \$1895, Czekowski, 926-8994.  
69 Imperial LeBaron 2-dr hardtop, AM-FM, stereo w/tape, air, beaucoups extras, 18,000 miles, good rubber. Campagna, 591-2974.  
66 VW, nice, 56,000 miles, valves recently ground. Nicholson, 591-3218.  
64 Triumph Spitfire, runs well, new paint, many spare parts, \$650. inn, 488-5266.  
69 Pontiac GTO, power, air, autotrans, xclnt condition, must sell. \$2500. Elder, 946-9192.  
66 Mustang, 6-cyl, autotrans, air, pwr steer/brakes. McCown, 471-0716.  
69 VW squareback, 18,000 miles, in warranty, air, radio. \$1850. Rutherford, 483-7451.  
67 Sunbeam Tiger II, Ford 289/4bbl, Shelby manifold, new poly tires, xclnt condition, 22,000 miles. \$2500. Zupp, 482-7156.  
61 2-dr Ford V-8, autotrans, 57,000 miles. \$150. Bostick, 591-2289.

### MISCELLANEOUS

Complete set of golf clubs, aluminum cart and molded top bag. \$110. Canin, 591-2856.  
Argus 541 automatic slide projector, 660 watts, remote control, like new. \$40. R. D. White, 877-3272.  
Three dark-finish round occasional tables, xclnt condition \$15 each. Hansen, 932-5203.  
IBM Model B electric executive typewriter, xclnt condition. \$250. Hansen, 932-5203.  
Brown Modacrylic wig, worn once, perfect, \$7.50. Speller, 932-5653.  
8-foot custom-built stereo component cabinet with enclosures for KLH-6 or similar speakers, walnut Formica covered, xclnt condition, best offer. Bednarczyk, 483-4588.  
Basket-type cartop carrier with straps. \$5. Lapko, 946-4311.  
Lido 14 4.3-meter sloop, \$950. Davidson,

946-2523.

White Edison baby bed with mattress, good condition, \$25. Campbell, 877-1456.

One case (20 boxes) Wanda shotgun shells, goose/duck 3/4 dr 1 1/4 oz #2 shot, 12 ga, \$1.75/box. Tremant, 591-3885.

Register male American Sheep Terrier pup, \$150. Seyl, 591-2366.

Two tropical fish tanks, 10 and 15 gal, stand, all access, \$45. Shomaker, 488-1163.

14-ft Checkmate, Johnson 60, trailer, xclnt condition. 877-4029.

Listing of used Lido 14 sailboats—where, condition, price, fleet activities. Hoover, 877-3366.

Williams Craft camper top, insulated, paneled, light. \$175. Cloudis, 471-2447.

Selmar Soloist B-flat clarinet, used two years by highschooler, xclnt condition, cost \$285—sell \$200. Rubenstein, 877-3288.

Trade 12-ft aluminum V-bottom boat for 12-foot D/W aluminum flat-bottom. Lankford, Dickinson 534-4451.

Like-new twin beds, walnut head/foot boards, foam mattress w/covers, pads; box springs, new quilted spreads. \$150. Kloetzer, 877-3365.

Beautiful AKC Afghan champion bloodline puppies, wormed, shots. \$150, terms. Jacobs, 474-3135.

Brushed-gold wedding band, interlocking 1/2-carat diamond solitaire engagement ring, unusual, size 6 1/2. \$250. 471-0585.

Bruning drafting machine, like new, used couple times. \$65. Reina, 488-1326.

Brunswick Montclair 4x8-foot slate-top pool table, \$575. Roberts, 485-3862.

Electrified antique organ, needs repair, \$150 as is. Foster, Dickinson 534-5358 after 5.

Three cute young Guinea pigs, \$2 each. Brown, 471-0066.

Kenmore 15-lb 10-cycle delux washer, used three months. 488-2184.

3-room house trailer, bath, good condition, at Caney Creek, make offer. Childs, Dickinson 534-5944.

ChrisCraft fiberglass deep-V Lancer, like new, 283 cu in V-8, galv tilt trailer, many extras. \$4000. Norman, 471-3157.

15-hp 2-cyl Michigan Marine Senior Twin, Paragon gear, strtr and gen need rebuild. White, 942-4472.

Like-new 2-pc orange Spanish living room suite, \$160. Autery, 472-5956.

Classical guitar, play to appreciate, \$65. Gorman, 521-9805.

Black leather contemporary chair and ottoman, like new, cost \$250—sell \$90. Cooper, 473-8047.

Own a piece of the action: memberships in Stearman and T-6 club open. Grow, 944-9152.

2-place Go-Kart, runs okay but could use a little work. Grow, 944-9152.

Conn Serenade elect organ, 2 full manuals, 25 foot pedals, mahog, w/bench, deliver, \$1400 or best offer. Huvar, 941-3777.

White baby bed and mattress still in carton. \$25. Huvar, 941-3777.

Poodle supplies: 2 clippers, cleaning fluid, shampoo, collars, leashes, bed, etc. \$50. Huvar, 941-3777.

Lined eggshell-color patio door drapes, \$5. Huvar, 941-3777.

Built-in gas Whirlpool range w/separate top burners and hood, xclnt condition. \$125. Huvar, 941-3777.

26-in girl's bicycle, \$10. Huvar, 941-3777

70 12x61-ft Chaparral Coronado mobile home, 3-ton air, 2-bdr, large bath, Spanish furn, \$100 equity-assume note. Hawkins, 932-3845.

EICO mono FM tuner, stereo amp, Electro-voice Princess speaker, \$95. Zrubek, 591-2549.

Like-New Kodak 500 2x2 slide projector, \$34. Klotz, 488-1514.

Free black and white 8-week old bright-eyed healthy kittens, Pearce, 747-4447.

### WANTED

Size 12 or 14 Bay Area Chorus ladies formal gown. Siler, 591-2787.

66 or later Corvair, with or without engine, must have 4-spd trans, \$200 or less. Zinn, 488-5266.

Small covered sandbox, with or without sand, will pay to \$15. LaMere, 479-7106.

Used lapidary equipment—saw, grinder, polisher, etc. Prefer diamond tools. Mayhew, 591-3291.

Self-contained camping trailer, around 15 feet. Mayhew, 591-3291.

### FOUND

Bifocal glasses in vicinity of Bldg 35 parking lot. Walton, Ext. 3638

Young female blond fox terrier/poodle (?) found on site Nov. 16. Sykes, Ext. 2851 or 645-7065.

## BOWLING STANDINGS

### Jimmy Warren Memorial League

	Won	Lost
Achievers	36	20
Pin Pounders	35	23
Bit Pickers	30	26
Real Timers	28	28
Fabricators	28	28
Alley Oops	28	28
Strikers	28	28
Roadrunners	26 1/2	29 1/2
Mixers	25	27
Blitzers	24	32
Chockers	22 1/2	23 1/2
Hexes	21	31

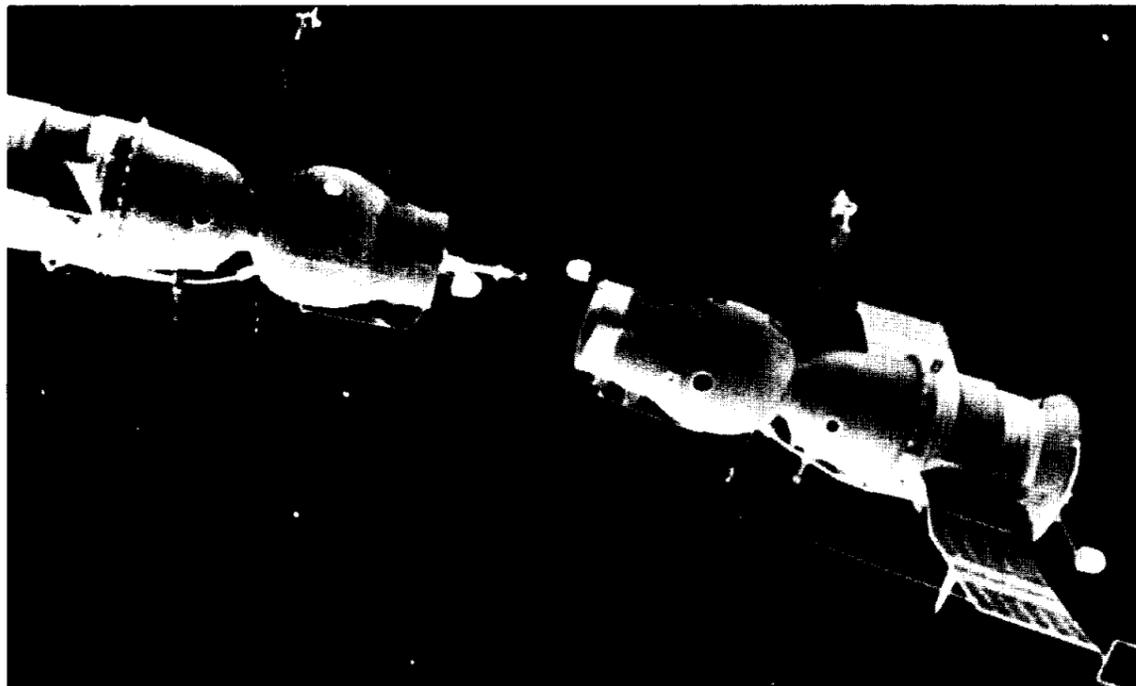
## Exchange Store Has Gift Ideas

The 17 shopping days until Christmas may not seem like enough time to cover all the names on the shopping list, but perhaps the list can be shortened by browsing through the MSC Exchange Store in the main cafeteria.

Open weekdays from 8:30 am to 4:30 pm and Saturday and Sunday from 10 am to 4:30 pm, the Exchange Store carries a wide variety of space-theme jewelry, such as necklaces, bracelets, ladies pins, earrings, tie tacs, key chains, lighters and cuff links. Other gift ideas for grown-ups include mugs, glasses and ashtrays, books, posters and color slides.

For the kids on the list, there are spacecraft model kits, space science books, book binders, Gemini and Apollo mission patches, and dolls of that comic-strip beagle.

Profits from Exchange Store sales go to the Exchange Council-MSC for use in projects such as the MSC employee recreational area now in the planning stages.



SOYUZ SPACECRAFT scale models approach for docking in an animated sequence from the Soviet film, Meeting in Orbit. The passive spacecraft in the rendezvous sequence remained broadside to the flight path for visibility and tracking until the last few yards of closing. The Soyuz 4 and 5 rendezvous and docking was followed by the first space crew transfer.

Photos on this page are blow-ups from the Soviet film, Meeting in Orbit, a documentary on last year's Soyuz 4/5 mission in which two cosmonauts transferred from one spacecraft to another after earth-orbit rendezvous and docking. The film was produced by the Center for Scientific Films of the USSR.

The 40-minute film covers the preparation for the dual mission, from academic training and zero-g flights in a Tu-104 up through the final simulations and oral exams before an examining board. The technique of using television out-the-window displays in the Soyuz simulator is quite similar to

the system used in the Apollo simulators.

Included in the film are scenes of cosmonaut family life and off-duty recreation, such as snow and water skiing and being with their children for the New Year's Tree.

The bulk of preflight checkout of a Soyuz spacecraft and its launch vehicle is done indoors, with the vehicle moved to the pad just hours before launch and erected to a vertical position much like Gemini. The cosmonaut crew reports to the pad aboard a passenger bus, salutes and makes a brief speech, and then takes the elevator to the spacecraft level. Soviet crews wear flight coveralls, and don pressure suits only for EVAs.

The film shows onboard motion pictures and television down-linked by both spacecraft during the mission. Soyuz 4, with Vladimir A. Shatalov aboard, was launched January 14, 1969 from the cosmodrome at Tyuratam. Soyuz 5, crewed by Yevgeny Khrunov, Alexei S. Yeliseyev and

## Meeting in Orbit... *Soviet style*

Boris Volynov, was launched the following day from the same location.

Rendezvous and docking took place on the sixteenth revolution of Soyuz 5, and Khrunov and Yeliseyev transferred EVA from Soyuz 5 over to Soyuz 4 to join Shatalov. Soyuz 4 reentry module landed near Karaganda, Kazakhstan, and Volynov landed Soyuz 5 solo near Kustanai.

Throughout the film, the docking and crew transfer between Soyuz 4 and 5 were described as the first steps toward a manned orbiting space station. In comparison, the docked weight of Soyuz 4/5 was 28,497 pounds; an Apollo spacecraft (CSM and LM) weighs more than 100,000 pounds at translunar injection. The total habitable volume of the orbital and entry modules of a Soyuz spacecraft is 318 cubic feet; the combined cabin volume of the Apollo CM and LM is 445 cubic feet.

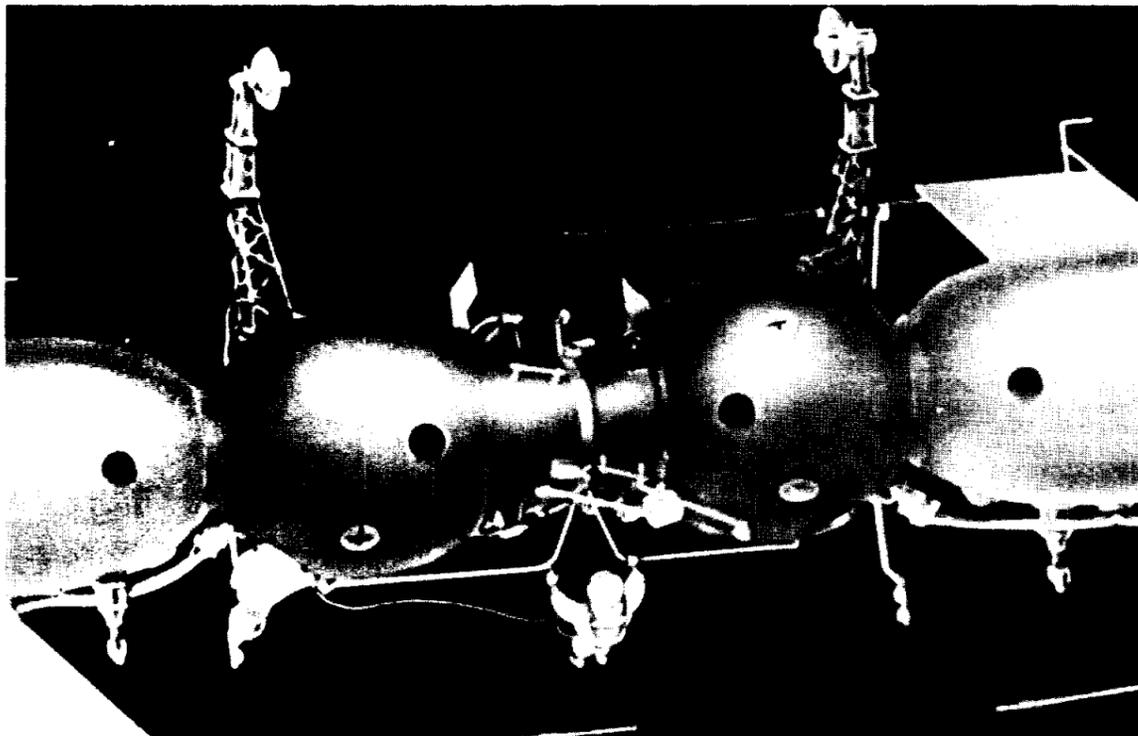
Onboard and ground photography and animation sequences in Meeting in Orbit were of high quality.



CHECKOUT COMPLETE in the shelter of a building at the Tyuratam cosmodrome in Central Asia, a Soyuz spacecraft and launch vehicle is moved by rail to the launch pad for erection and fueling. Note the multiple-cluster rocket engines on the first stage of the launch vehicle.



SOYUZ 4 PILOT Vladimir Shatalov bones up on his celestial navigation techniques. Onboard film showed Soyuz 4/5 crewmen using ordinary mariner's sextant for computing spacecraft position.



FIRMLY LATCHED together by the docking mechanism, the orbital sections of the Soyuz 4 and 5 spacecraft are depressurized for the EVA transfer by Khrunov and Yeliseyev from Soyuz 5 to Soyuz 4. Animation shows the two cosmonauts moving hand-over-hand along a handrail from one hatch to the other. Khrunov and Yeliseyev brought a pouch of family letters and newspapers to Shatalov.



SOYUZ SPACECRAFT hand controller looks somewhat similar to an Apollo command module hand controller. This frame is from a film sequence on crew training in the Soyuz orbital section simulator. One cockpit display is an Earth globe which rotates to show spacecraft position, and is reminiscent of a similar display used in early models of the Mercury spacecraft.